Claims: What is claimed:

1. A system of implementing a virtual loopback in Ethernet switching elements or Ethernet networks consisting of:

    a. A virtual loopback setup process which selects the virtual circuit to be looped back, the Ethernet switch in the network at which the virtual loopback will take place, issuance of a request virtual loopback command, and issuance of acknowledgement messages by the loopback switch to inform the requestor and the virtual circuit's source and/or destination of the outcome of the virtual loopback setup command request. If successful, the loopback switch modifies its switching table so that frames belonging to the specified virtual circuit are forwarded to the switch processor.

    b. A virtual loopback operational process where frames are sent along a virtual circuit's normal path through the network, arrive at a loopback switch previously setup to loopback that virtual circuit, are forwarded to the switch processor, have their destination MAC address rewritten to a new MAC address used for testing, have their source MAC address rewritten as the switch processor's MAC address, and are sent back into the switching network.

    c. A virtual loopback removal process where a remove virtual loopback command request is issued to the loopback switch, the issuance of acknowledgement messages by the loopback switch to inform the requestor and the virtual circuit's source and/or destination of the outcome of the virtual loopback teardown command request. If successful, the loopback switch modifies its switching table so that frames belonging to the specified virtual circuit are forwarded normally, and no longer diverted to the switch processor.

    whereby a virtual loopback sends frames to user-specified locations in the network.

    2. The system of claim 1 wherein the information regarding the virtual circuit information and the loopback switch identification is obtained by the issuance of a path request command, which causes an iterative query of the network to determine a virtual circuit's path through the network.

3. The system of claim 1 wherein the virtual loopback setup request optionally specifies a timeout value which will cause the virtual loopback to be automatically released after a set amount of time.

4. The system of claim 1 wherein the virtual loopback setup command request specifies a virtual circuit identified by a network-determined virtual circuit ID.

5. The system of claim 1 wherein the virtual loopback setup command request specifies a loopback switch identified by a network-determined node ID.

6. The system of claim 1 wherein the acknowledgement messages to the source and/or destination of the virtual circuit takes the form of an ICMP message

   7. The messages of claim 6 wherein the ICMP message conveyed is HOST UNREACHABLE for setup and teardown

   8. The messages of claim 6 wherein the ICMP message conveyed is PORT UNREACHABLE for setup and teardown

9. The system of claim 1 wherein an operating virtual loopback will be automatically removed by the network if a timeout timer was specified in the virtual loopback setup, wherein the loopback switch itself or an external management system will automatically issue a remove virtual loopback command request.

10. The system of claim 1 wherein an operating virtual loopback can be removed at any time by a remove loopback command request.

11. A method for setting up a virtual loopback in Ethernet switching elements or Ethernet networks, comprising the following steps:

   a. Sending a command to the loopback switch requesting a virtual loopback for a specific virtual circuit.

   b. The loopback switch determining if it can implement the requested virtual loopback.

   c. If the loopback switch cannot implement the virtual loopback request, it sends a denial message back to the requestor of the virtual loopback.

   d. If the loopback switch can implement the virtual loopback, it modifies its switch table so that all frames belonging to the specified virtual circuit are

switched to the switch processor, and then sends a setup completed message to the requestor and a notification message to the source and/or destination of the virtual circuit.

wherein now a frame can successfully be sent to a new port.

12. The method of claim 11 wherein the request takes the form of OPERATE_VLOOPBACK(parameters).

13. The request of claim 12 wherein one parameter is the virtual circuit ID.

14. The request of claim 12 wherein one parameter is the node ID of the loopback switch.

15. The request of claim 12 wherein one parameter is the DESTINATION_ADDRESS within the network.

16. The request of claim 12 wherein one parameter is the virtual loopback timeout value.

17. The method of claim 11 wherein in order to determine the loopback node, the virtual loopback requestor first requests the list of nodes traversed through the network by a given virtual circuit, and the local switch performs this inquiry by iteratively querying successive nodes along the virtual circuit path, and then presents this information to the requestor.

18. The method of claim 11 wherein the message to the source and/or destination of the virtual circuit is an ICMP message.

19. The message of claim 17 wherein the ICMP message conveyed is HOST UNREACHABLE.

20. The message of claim 17 wherein the ICMP message conveyed is PORT UNREACHABLE.

21. A method for operating a virtual loopback in Ethernet switching elements or Ethernet networks comprising the following steps:

a. The source/originator sends a frame belonging to a specific virtual circuit along its normal path through the network.

b. When the frame reaches the loopback switch, the frame is diverted to the switch processor.

c. The switch processor rewrites the destination MAC address as the new DESTINATION_ADDRESS MAC address.

d. The switch processor rewrites the source MAC address as its MAC address.

e. The switch processor sends the modified frame back to the switching matrix where normal switching rules return the frame to the new DESTINATION_ADDRESS.

wherein frames are successfully sent to a new port.

22. The method of claim 20 wherein the virtual loopback process will timeout if a timeout parameter was specified in the virtual loopback setup.

23. The method of claim 20 wherein the virtual loopback can be manually removed at any time.

24. A method for removing a virtual loopback in Ethernet switching elements or Ethernet networks comprising the following steps:

a. At any time the removal of a virtual loopback may be requested by sending a remove virtual loopback command request the loopback switch. If a previously configured timeout timer expires, the loopback switch issues a remove virtual loopback command request to itself.

b. Upon receipt of a remove virtual loopback command request, the loopback switch determines if it can complete the request.

c. If the loopback switch cannot complete the remove virtual loopback request, it issues a denial to the requestor.

d. If the loopback switch can complete the request it restores the switching table such that frames belonging to a given virtual circuit are forwarded normally and are no longer diverted to the switch processor, issues a removal completed message to the requestor, and optionally issues a notification to the source and/or destination of the virtual circuit that the virtual loopback has been removed.

wherein a virtual loopback is now removed and no longer affects frame traffic

25. The method of claim 23 wherein the remove request takes the form REMOVE_VLOOPBACK(parameters).

26. The request of claim 24 wherein one parameter is the virtual circuit ID.

27. The method of claim 23 wherein the notification to the source and/or destination of the virtual circuit takes the form of an ICMP message.